

Patent
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CLEAN VERSION

IN THE CLAIMS:

Kindly cancel original claim 1, without prejudice.

Please add the new claims 11-25, as shown below:

11. (New) A tool holder attachment structure, for removably securing a tool holder with a tool in a tapered attachment hole of main shaft of a machining tool, comprising:

- a shank having a tapered outer perimeter surface;

- said shank provided on said tool holder;

- a plurality of elastic engagement pieces abutting an outer perimeter surface of said tapered outer perimeter surface of said tool holder and being elastically deformable in a radial direction during a fitting;

- said plurality of elastic engagement pieces disposed at an inner surface section of said tapered attachment hole of said main shaft; and

- said shank in said tapered attachment hole of said main shaft and said tool holder secured to said main shaft during said fitting with said plurality of elastic engagement pieces elastically deformed in said radial direction.

12. (New) A tool holder attachment structure, according to claim 11, further comprising:

- a plurality of ring-shaped grooves formed at said inner surface section of said attachment hole of said main shaft at a predetermined interval along an axial center of said main shaft, said plurality of ring-shaped grooves and said plurality of elastic engagement pieces being arranged in an alternating manner along said axial center; and

- said formation of said plurality of ring-shaped grooves allowing said

plurality of elastic engagement pieces to be integrally formed with said main shaft.

13. (New) A tool holder attachment structure, according to claim 12, wherein: said elastic engagement pieces are sloped relative to a plane perpendicular to said axial center of said main shaft.

14. (New) A tool holder attachment structure, according to claim 13, wherein: toward an inner perimeter, said elastic engagement pieces are each sloped toward a wider end of a tapered shape of said attachment hole.

15. (New) A tool holder attachment structure, according to claim 12, wherein: said elastic engagement pieces are formed parallel to a plane perpendicular to said axial center of said main shaft.

16. (New) A tool holder attachment structure, according to claim 14, further comprising:

a plurality of grooves extending longitudinally along said tapered attachment hole being formed at said inner surface section of said tapered attachment hole in a symmetrical arrangement relative to said axial center.

17. (New) A tool holder attachment structure, according to claim 11, further comprising:

an elastic flange extending radially from said tool holder abuts an outer end surface of said main shaft and elastically deforms parallel with said axial center when said tool holder is mounted on said main shaft.

18. (New) A tool holder attachment structure, according to claim 16, further comprising:

an elastic flange extending radially from said tool holder abuts an outer end surface of said main shaft and elastically deforms parallel with said axial center when said tool holder is mounted on said main shaft.

19. (New) A tool holder attachment structure, according to claim 17, further comprising:

a ring-shaped groove being formed at a radially inward position on said

elastic flange;

said elastic flange being formed with a ring shape; and

a ring-shaped sloped groove being formed at a radially outward position on said elastic flange.

20. (New) A tool holder attachment structure, according to claim 11, wherein: said plurality of elastic engagement pieces are a plurality of collar-shaped members secured to said inner surface section of said tapered attachment hole of said main shaft.

21. (New) A tool holder attachment structure, according to claim 11, wherein: a cross-section shape of said tapered attachment hole and said shank along a plane perpendicular to said axial center is a non-circular shape effective to transfer a rotational torque during a use of said tool, whereby said rotational torque is transferred from said tapered attachment hole of said main shaft to said shank without using a key.

22. (New) A tool holder attachment structure, according to claim 16, wherein: a cross-section shape of said tapered attachment hole and said shank along a plane perpendicular to said axial center forms a non-circular shape effective to transfer a rotational torque during a use of said tool, whereby said rotational torque is transferred from said tapered attachment hole of said main shaft to said shank without using a key.

23. (New) A tool holder attachment structure, for removably securing a tool holder with a tool to a main shaft of a machining tool, comprising:

at least a shank on said tool holder;

said shank having at least a tapered outer perimeter surface;

said main shaft including a tapered attachment hole;

means for elastically securing said shank in said attachment hole of said main shaft and eliminating vibration and attachment failure during a use of said machining tool and said tool holder attachment;

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at least a plurality of elastic engagement pieces in said means for elastically securing;

said elastic engagement pieces arrayed concentrically around an inner perimeter section of said attachment hole;

said elastic engagement pieces extending away from said main shaft and elastically abutting said tapered outer perimeter surface of said shank during an insertion of said shank into said attachment hole; and

said elastic engagement pieces elastically deforming in at least a first radial direction during said insertion and said use, whereby said means for elastically securing enables said elastic engagement pieces to absorb a plurality of use vibrations while maintaining a secure attachment between said main shaft and said tool holder.

24. (New) A tool holder attachment structure, according to claim 23, further comprising:

a plurality of ring-shaped grooves on said inner perimeter section of said attachment hole;

said plurality of ring-shaped grooves arrayed alternately with respective said elastic engagement pieces in an axial direction along said inner perimeter section of said attachment hole;

said plurality of ring-shaped grooves including smooth radius contours at bottom portions thereof, thereby minimizing elastic stress concentration; and

said plurality of elastic engagement pieces extending integrally from said main shaft, thereby simplifying manufacturing and assembly of said main shaft and said tool holder with a uniform force.

25. (New) A tool holder attachment structure, according to claim 24, wherein:

said plurality of elastic engagement pieces, each having a first length, extends from each respective ring-shaped groove to respective said inner

perimeter section of said tapered attachment hole;

an end of each said elastic engagement piece arrayed in a plane parallel to said tapered outer perimeter surface of said shank, whereby each said elastic engagement piece contacts said tapered outer perimeter surface simultaneously during said insertion to provide easy alignment and tight attachment; and

said first length of each respective said elastic engagement piece being dependant upon a position on said tapered attachment hole relative to said tapered outer perimeter surface of said shank.